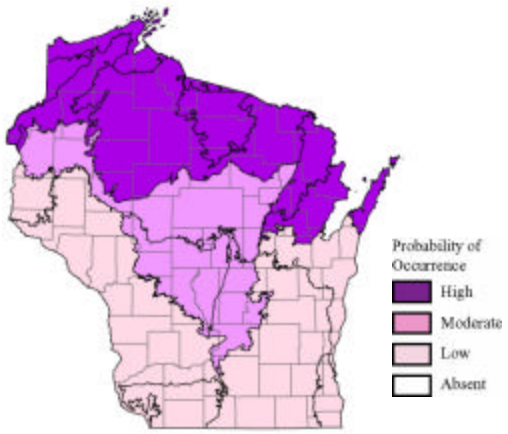
3.1.5.3 Individual Mammal Species of Greatest Conservation Need Summaries

Water Shrew (*Sorex palustris*)

Species Assessment Scores*

State rarity:	4
State threats:	3
State population trend:	3
Global abundance:	4
Global distribution:	3.5
Global threats:	3
Global population trend:	3
Mean Risk Score:	3.4
Area of importance:	2

* Please see the Description of Vertebrate Species Summaries (Section 3.1.1) for definitions of criteria and scores.



Ecological Landscape Associations
Please note that this is not a range map. Shading does not imply that the species is present throughout the Landscape, but represents the probability that the species occurs somewhere in the Landscape.

Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
North Central Forest	Coldwater streams
North Central Forest	Coolwater streams
North Central Forest	Hardwood swamp
North Central Forest	Northern wet forest
North Central Forest	Northern wet-mesic forest
Northeast Sands	Coldwater streams
Northeast Sands	Coolwater streams
Northeast Sands	Northern wet-mesic forest
Northern Highland	Coolwater streams
Northern Highland	Northern wet forest
Northern Lake Michigan Coastal	Northern wet-mesic forest
Northwest Lowlands	Northern wet forest
Northwest Sands	Coldwater streams
Northwest Sands	Coolwater streams
Northwest Sands	Northern wet forest
Superior Coastal Plain	Boreal forest
Superior Coastal Plain	Coldwater streams
Superior Coastal Plain	Coolwater streams

Threats and Issues

- Loss and degradation of habitat, especially water quality, from road construction, development, improperly conducted logging or agriculture, drainage, and other activities is the primary management concern for water shrews.
- Invasive species are threatening aquatic habitat, and as a result water shrews are at risk for possible new diseases, parasites, or decline from loss of habitat.

- Direct contamination from chemicals and heavy metals threatens water shrews, as shrews feeding on invertebrates accumulate and concentrate pesticides and heavy metals in their tissues.
- Chemical pollution and other activities that degrade water quality in suitable stream habitats are a major threat to water shrews. Pollution may result from insecticide treatments targeting exotic species (e.g., gypsy moth), acid rain, and other factors.
- Sedimentation and stream temperature changes which reduce or eliminate the water shrew's primary food sources (aquatic larvae of caddisflies, stoneflies, mayflies, true flies, and leaches and snails) are a threat to this species.

Priority Conservation Actions

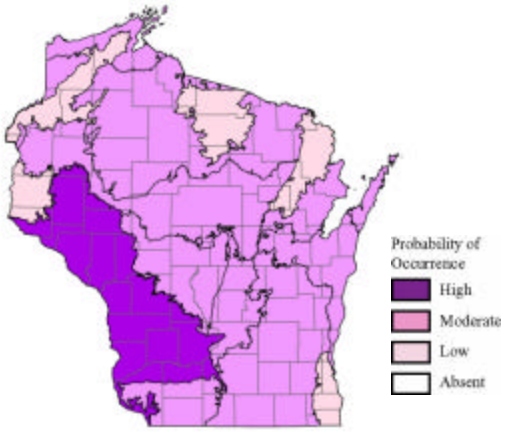
- Occupied habitat should be mapped and a low impact monitoring program should be maintained to inform conservation efforts directed at this species.
- There is a need to enforce existing regulations requiring buffer strips and habitat maintanence along water ways that contain water shrews.
- Protection and restoration of natural stream habitat is needed, particularly in areas with fast-flowing shallow waters that water shrews appear to prefer.
- Pesticide use that might impact aquatic/riparian invertebrate populations should be avoided whenever possible.
- Develop additional guidelines for activities that may potentially impact water shrew habitat such as road building, non-sustainable methods of timber harvest, agriculture, and surface mining. During timber harvest, water quality concerns can be addressed by applying voluntary Forestry Best Management Practices for water quality.
- Opportunities and training that would allow citizens to assist with monitoring efforts, including distribution and abundance information, would benefit this species.

Northern Long-eared Bat (*Myotis septentrionalis*)

Species Assessment Scores*

State rarity:	2
State threats:	3
State population trend:	3
Global abundance:	4
Global distribution:	4
Global threats:	2
Global population trend:	3
Mean Risk Score:	3
Area of importance:	2

* Please see the Description of Vertebrate Species Summaries (Section 3.1.1) for definitions of criteria and scores.



Ecological Landscape Associations
Please note that this is not a range map. Shading does not imply that the species is present throughout the Landscape, but represents the probability that the species occurs somewhere in the Landscape.

Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Central Sand Hills	Coldwater streams
Forest Transition	Coldwater streams
Forest Transition	Coolwater streams
North Central Forest	Coldwater streams
North Central Forest	Coolwater streams
North Central Forest	Ephemeral pond
Superior Coastal Plain	Coldwater streams
Superior Coastal Plain	Coolwater streams
Western Coulee and Ridges	Coldwater streams
Western Coulee and Ridges	Coolwater streams
Western Coulee and Ridges	Emergent marsh
Western Coulee and Ridges	Ephemeral pond
Western Coulee and Ridges	Floodplain forest
Western Coulee and Ridges	Hemlock relict
Western Coulee and Ridges	Oak barrens
Western Coulee and Ridges	Oak woodland
Western Coulee and Ridges	Shrub-carr
Western Coulee and Ridges	Southern dry forest
Western Coulee and Ridges	Southern dry-mesic forest
Western Coulee and Ridges	Southern mesic forest
Western Coulee and Ridges	Submergent marsh
Western Coulee and Ridges	Warmwater rivers

Threats and Issues

- Lack of information on basic ecology and population trends of the northern long-eared bat is one of the greatest threats to conservation of this species.
- The availability of hibernacula (caves and mines) with appropriate environmental conditions may be a threat to this species. Seasonal flooding may make some caves unsuitable in some years and

reduction in ground water flow could alter cave humidity. Thus, alternate sites are needed for periods with unusual climatic conditions.

- This species can be expected to experience increasing threats in years to come, as more old mines cave in or are closed (often to reduce legal liability of landowners), limiting the availability of suitable hibernacula.
- Wind farms are a recent addition to the landscape in many parts of the United States. Bat fatality at wind turbines has been documented in all regions and in varying habitat conditions across North America. Annual mortality varies, but is conservatively estimated to vary from <2 to nearly 50 bats/turbine/year. Mortalities of northern long-eared bats have been documented, along with all other bat species present in Wisconsin. Current evidence suggests that bat mortality appears to be highest in or near forests, especially along ridge tops, moderate in open areas close to forest in the Midwest, and lowest in open grassland or farmland away from forests. Because bats are long-lived, have low reproductive rates, and appear to be especially vulnerable to wind turbines, solutions are needed to prevent or minimize this new threat, whose cumulative impacts on populations of bats could be significant.
- Removal of nursery trees and loss of foraging habitat damages local breeding populations.
- This species is sensitive to disturbance during hibernation; frequently aroused bats may deplete their energy reserves, potentially leading to mortality from starvation before spring arrives. Cave and mine visitation by recreational cavers, tour groups, and vandals during the winter hibernation period, and large-scale banding efforts is a major threat for this species.
- With a reproductive rate of just one offspring per year per female, damage to a population could be very slow to repair.
- Northern long-eared bats consume a variety of softer-bodied invertebrate prey, limited perhaps only by the size of prey it can physically take (Kunz and Kaiser 1978). As arthropod diversity correlates with plant species diversity, this dietary variability would suggest the need for a diverse forest flora. Non-native plant establishment tends to reduce native plant diversity and could thus negatively impact the prey base for this species.
- Insecticide use in agricultural and forested landscapes may threaten bats through direct contact and indirectly through the reduction of target and non-target prey species. Insecticides are frequently sprayed during bat foraging periods, especially in the early morning, evening, or night, in order to target mosquitoes, avoid killing honeybees, and take advantage of quiet wind conditions. When directly exposed, bats may absorb chemicals through their lungs and skin, or by ingesting contaminated insects or polluted water (Clark 1981). Several studies link mortality of both juvenile and adult bats to organochlorine insecticides such as heptachlor, and dieldrin, which is linked to DDT (no longer used but still persisting in ecosystems) and its metabolites, DDD and DDE. Organochlorine insecticides are believed to kill mostly young bats when the chemicals, concentrated in the fat of the mother's milk, are passed to the pups or when flight begins and fat reserves from lactation are burned. Adult bats are most likely to be affected by fat-soluble toxins released when fat reserves are consumed during migration or hibernation (Clark 1981, 1988, Clark *et al*. 1978a, 1978b).

Priority Conservation Actions

- Protection of hibernacula and maternity roosts from disturbances, possibly by gating entrances with bat compatible gates, is of highest priority.
- The northern long-eared bat has an apparent reliance on mature forest habitats. Tall, wide-diameter, partially dead trees with a high percent of bark remaining are favored by the northern long-eared bat. Such trees tend to be found in over-mature forest stands (Sasse and Perkins 1996, Caceres, unpubl. data). A study in New Hampshire found that northern long-eared bats relied on the largest available snags in a forest stand as summer roosts. Forest management that maintains existing large snags and

provides large trees for future snags should benefit northern long-eared bats (Bats Conservation International 2001).

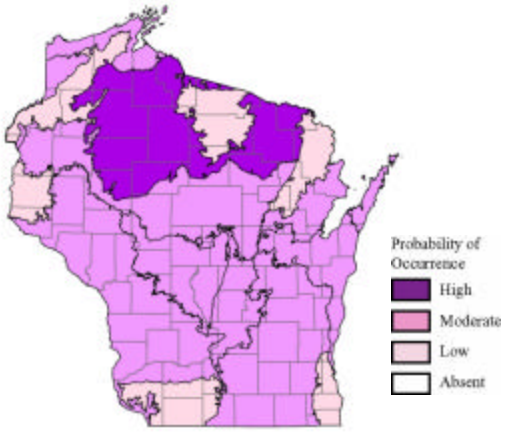
- Maintenance of adequate habitat for all life history stages and activities, and protection of hibernacula from disturbances, including hydrological changes, are important management requirements.
- Legislation is needed to increase protection of bats during all phases of their life history, i.e., hibernation, foraging, nursery colonies, and summer roost sites.
- Research is needed on most aspects of life history, including hibernation, roosting, and foraging habitat requirements, population dynamics, population trends, and migration and dispersal patterns. An assessment of the habitats needed to support all life history stages and activities is needed before adequate stewardship programs can be devised. Telemetry studies of both sexes are necessary (Kurta 1995). Inventories should be conducted in advance of large-scale habitat modifications that would result in the loss of older forest or removal of standing dead trees within areas known or suspected to contain this species.
- Outreach is needed to educate the public on bat biology and ecology, to reduce unfounded fears and myths, and to provide training for citizens to assist in monitoring efforts.
- A statewide bat management plan is needed to outline a coordinated and comprehensive approach to bat conservation in Wisconsin, and should include identification of and roles for conservation partners.

Silver-haired Bat (*Lasionycteris noctivagans*)

Species Assessment Scores*

State rarity:	2
State threats:	4
State population trend:	3
Global abundance:	4
Global distribution:	3
Global threats:	3
Global population trend:	3
Mean Risk Score:	3.1
Area of importance:	2

* Please see the Description of Vertebrate Species Summaries (Section 3.1.1) for definitions of criteria and scores.



Ecological Landscape Associations
Please note that this is not a range map. Shading does not imply that the species is present throughout the Landscape, but represents the probability that the species occurs somewhere in the Landscape.

Landscape-community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Central Sand Hills	Coldwater streams
Forest Transition	Coldwater streams
Forest Transition	Coolwater streams
North Central Forest	Alder thicket
North Central Forest	Coldwater streams
North Central Forest	Coolwater streams
North Central Forest	Emergent marsh
North Central Forest	Ephemeral pond
North Central Forest	Hardwood swamp
North Central Forest	Inland lakes
North Central Forest	Northern mesic forest
North Central Forest	Northern sedge meadow
North Central Forest	Northern wet forest
North Central Forest	Northern wet-mesic forest
North Central Forest	Open bog
North Central Forest	Submergent marsh
North Central Forest	Warmwater rivers
North Central Forest	Warmwater streams
Superior Coastal Plain	Coldwater streams
Superior Coastal Plain	Coolwater streams
Western Coulee and Ridges	Coldwater streams
Western Coulee and Ridges	Coolwater streams

Threats and Issues

- Wind farms are a recent addition to the landscape in many parts of the United States. Bat fatality at wind turbines has been documented in all regions and in varying habitat conditions across North America. Annual mortality varies, but is conservatively estimated to vary from <2 to nearly 50 bats/turbine/year. Silver-haired bats are one of the species killed most frequently. Current evidence suggests that bat mortality appears to be highest in or near forests, especially along ridge tops,

moderate in open areas close to forest in the Midwest, and lowest in open grassland or farmland away from forests. Because bats are long-lived, have low reproductive rates, and appear to be especially vulnerable to wind turbines, solutions are needed to prevent or minimize this new threat, whose cumulative impacts on populations of bats could be significant.

- Removal of nursery trees and loss of foraging habitat damages local breeding populations.
- Silver-haired bats eat a variety of arthropods. They consume flies, midges, leafhopers, moths, mosquitoes, beetles, true bugs, and ants. Although silver-haired bat diets vary widely in types of insects eaten, they seem to select mostly small, soft-bodied species, especially those that swarm in groups (Bat Conservation International 2001). As arthropod diversity correlates with plant species diversity, this dietary variability would suggest the need for a diverse forest flora. Non-native plant establishment tends to reduce native plant diversity and could thus negatively impact the prey base for the silver-haired bat.
- Insecticide use in agricultural and forested landscapes may threaten bats through direct contact and indirectly through the reduction of target and non-target prey species. Insecticides are frequently sprayed during bat foraging periods, especially in the early morning, evening, or night, in order to target mosquitoes, avoid killing honeybees, and take advantage of quiet wind conditions. When directly exposed, bats may absorb chemicals through their lungs and skin, or by ingesting contaminated insects or polluted water (Clark 1981). Several studies link mortality of both juvenile and adult bats to organochlorine insecticides such as heptachlor, and dieldrin, which is linked to DDT (no longer used but still persisting in ecosystems) and its metabolites, DDD and DDE. Organochlorine insecticides are believed to kill mostly young bats when the chemicals, concentrated in the fat of the mother's milk, are passed to the pups or when flight begins and fat reserves from lactation are burned. Adult bats are most likely to be affected by fat-soluble toxins released when fat reserves are consumed during migration or hibernation (Clark 1981, 1988b, Clark *et al*. 1978a, 1978b).

Priority Conservation Actions

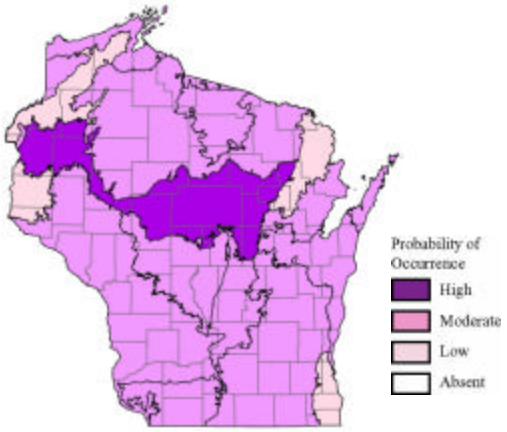
- Protection of foraging habitat and of summer roosting areas associated with mature or old-growth forests having a diverse age structure and high densities of large snags is needed for conservation of this species. Limited research from western forests suggests that silver-haired bats prefer roosts higher than 10 m above the ground in large diameter snags. Thus land management that focuses on recruitment and retention of snags and the maintenance of structural complexity in upland as well as riparian areas is important for conservation of this species (Campbell *et al*. 1996).
- Legislation is needed that increases protection of bats during all phases of their life history, i.e., migration, foraging, nursery sites, and summer roost sites.
- Research is needed on most aspects of life history, including roosting, and foraging habitat requirements, population dynamics, population trends, and migration and dispersal patterns. An assessment of the habitats needed to support all life history stages and activities is needed before adequate stewardship programs can be devised.
- Inventories should be conducted in advance of large-scale habitat modifications that would result in the loss of older forest or removal of standing dead trees within areas known or suspected to contain this species.
- Outreach is needed to educate the public on bat biology and ecology, to reduce unfounded fears and myths, and to provide training for citizens to assist in monitoring efforts.
- A statewide bat management plan is needed to outline a coordinated and comprehensive approach to bat conservation in Wisconsin, and should include identification of and roles for conservation partners.

Eastern Red Bat (*Lasiurus borealis*)

Species Assessment Scores*

State rarity:	2
State threats:	4
State population trend:	3
Global abundance:	4
Global distribution:	3
Global threats:	3
Global population trend:	3
Mean Risk Score:	3.1
Area of importance:	2

* Please see the Description of Vertebrate Species Summaries (Section 3.1.1) for definitions of criteria and scores.



Ecological Landscape Associations
Please note that this is not a range map. Shading does not imply that the species is present throughout the Landscape, but represents the probability that the species occurs somewhere in the Landscape.

Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Central Sand Hills	Coldwater streams
Forest Transition	Coldwater streams
Forest Transition	Coolwater streams
Forest Transition	Ephemeral pond
Forest Transition	Northern mesic forest
Forest Transition	Northern wet forest
Forest Transition	Northern wet-mesic forest
Forest Transition	Warmwater rivers
Forest Transition	Warmwater streams
North Central Forest	Coldwater streams
North Central Forest	Coolwater streams
North Central Forest	Ephemeral pond
Northern Highland	Coolwater streams
Superior Coastal Plain	Coldwater streams
Superior Coastal Plain	Coolwater streams
Western Coulee and Ridges	Coldwater streams
Western Coulee and Ridges	Coolwater streams

Threats and Issues

- Lack of information on basic ecology and population trends of the eastern red bat is one of the greatest threats to conservation of this species.
- Wind farms are a recent addition to the landscape in many parts of the United States. Bat fatality at wind turbines has been documented in all regions and in varying habitat conditions across North America. Annual mortality varies, but is conservatively estimated to vary from <2 to nearly 50 bats/turbine/year. Eastern red bats are one of the species killed most frequently. Current evidence suggests that bat mortality appears to be highest in or near forests, especially along ridge tops, moderate in open areas close to forest in the Midwest, and lowest in open grassland or farmland away

from forests. Because bats are long-lived, have low reproductive rates, and appear to be especially vulnerable to wind turbines, solutions are needed to prevent or minimize this new threat, whose cumulative impacts on populations of bats could be significant.

- Removal of roosting habitat (forested areas, wooded hedgerows, and areas with large shade trees) and loss of foraging habitat (mostly along the edges of pastures, crop lands, or other openings dotted with large deciduous trees) damages local breeding populations.
- Insecticide use in agricultural and forested landscapes may threaten bats through direct contact and indirectly through the reduction of target and non-target prey species. Insecticides are frequently sprayed during bat foraging periods, especially in the early morning, evening, or night, in order to target mosquitoes, avoid killing honeybees, and take advantage of quiet wind conditions. When directly exposed, bats may absorb chemicals through their lungs and skin, or by ingesting contaminated insects or polluted water (Clark 1981). Several studies link mortality of both juvenile and adult bats to organochlorine insecticides such as heptachlor, and dieldrin, which is linked to DDT (no longer used but still persisting in ecosystems) and its metabolites, DDD and DDE. Organochlorine insecticides are believed to kill mostly young bats when the chemicals, concentrated in the fat of the mother's milk, are passed to the pups or when flight begins and fat reserves from lactation are burned. Adult bats are most likely to be affected by fat-soluble toxins released when fat reserves are consumed during migration or hibernation (Clark 1981, 1988b, Clark *et al*. 1978a, 1978b).

Priority Conservation Actions

- Protection of foraging habitat, if disjunct from summer roosts and maternity colonies, may be most effectively gained through private or public landowner cooperation.
- Protection and restoration of summer roosting areas and sites are needed. These include both areas associated with older forests having a diverse age structure, and hedgerow roosting habitat along crop borders. Specific roosting preferences include areas with: 1) dense vegation above; 2) unobstructed space below, allowing bats to drop to gain flight; 3) no potential perches beneath, which could aid detection by birds or other animals; 4) dark-colored ground cover, minimizing reflected sunlight; 5) sufficient surrounding vegetation to protect from wind and enhance heat and humidity retention; and 6) southern exposure, where vegetation is the most dense and heat gain is the greatest (Bat Conservation International 2001).
- Plan controlled burning in deciduous forests to minimize mortality in areas where red bats are known or suspected to hibernate at ground level in the leaf litter (Bat Conservation International 2001).
- Support legislation that increases protection of bats during all phases of their life history, i.e., migration, foraging, nursery sites, and summer roost sites.
- Research is needed on most aspects of life history, including roosting, and foraging habitat requirements, population dynamics, population trends, and migration and dispersal patterns. An assessment of the habitats needed to support all life history stages and activities is needed before adequate stewardship programs can be devised.
- Inventories should be conducted in advance of large-scale habitat modifications that would result in the loss of older forest or removal of standing dead trees within areas known or suspected to contain this species.
- Outreach is needed to educate the public on bat biology and ecology, to reduce unfounded fears and myths, and to provide training for citizens to assist in monitoring efforts.
- A statewide bat management plan is needed to outline a coordinated and comprehensive approach to bat conservation in Wisconsin.

Hoary Bat (*Lasiurus cinereus*)

Species Assessment Scores*

State rarity:	2
State threats:	4
State population trend:	3
Global abundance:	4
Global distribution:	3
Global threats:	3
Global population trend:	3
Mean Risk Score:	3.1
Area of importance:	2

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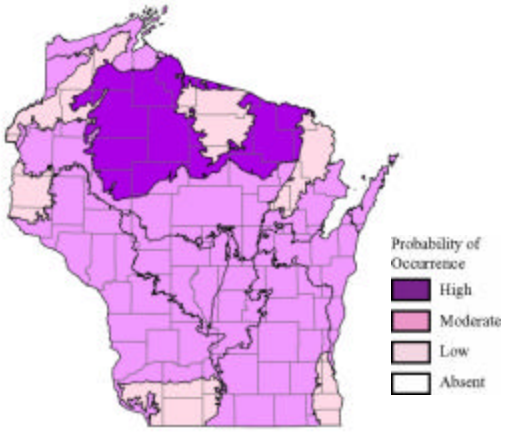


Ecological Landscape Associations
Please note that this is not a range map. Sh ading does not imply that the species is present throughout the Landscape, but represents the probability that the species occurs somewhere in the Landscape.

Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Central Sand Hills	Coldwater streams
Forest Transition	Coldwater streams
Forest Transition	Coolwater streams
North Central Forest	Alder thicket
North Central Forest	Coldwater streams
North Central Forest	Coolwater streams
North Central Forest	Emergent marsh
North Central Forest	Ephemeral pond
North Central Forest	Hardwood swamp
North Central Forest	Inland lakes
North Central Forest	Northern mesic forest
North Central Forest	Northern sedge meadow
North Central Forest	Northern wet forest
North Central Forest	Northern wet-mesic forest
North Central Forest	Open bog
North Central Forest	Submergent marsh
North Central Forest	Warmwater rivers
North Central Forest	Warmwater streams
Superior Coastal Plain	Coldwater streams
Superior Coastal Plain	Coolwater streams
Western Coulee and Ridges	Coldwater streams
Western Coulee and Ridges	Coolwater streams

Threats and Issues

- Lack of information on basic ecology and population trends of the hoary bat is one of the greatest threats to conservation of this species
- Wind farms are a recent addition to the landscape in many parts of the United States. Bat fatality at wind turbines has been documented in all regions and in varying habitat conditions across North

America. Annual mortality varies, but is conservatively estimated to vary from <2 to nearly 50 bats/turbine/year. Hoary bats are one of the species killed most frequently. Current evidence suggests that bat mortality appears to be highest in or near forests, especially along ridge tops, moderate in open areas close to forest in the Midwest, and lowest in open grassland or farmland away from forests. Because bats are long-lived, have low reproductive rates, and appear to be especially vulnerable to wind turbines, solutions are needed to prevent or minimize this new threat, whose cumulative impacts on populations of bats could be significant.

- Loss of roosting habitat, nursery trees, and foraging habitat damages local breeding populations.
- Use of pesticides on public forest lands may be a potential source of mortality to roosting bats and their insect prey.
- Insecticide use in agricultural and forested landscapes may threaten bats through direct contact and indirectly through the reduction of target and non-target prey species. Insecticides are frequently sprayed during bat foraging periods, especially in the early morning, evening, or night, in order to target mosquitoes, avoid killing honeybees, and take advantage of quiet wind conditions. When directly exposed, bats may absorb chemicals through their lungs and skin, or by ingesting contaminated insects or polluted water (Clark 1981). Several studies link mortality of both juvenile and adult bats to organochlorine insecticides such as heptachlor, and dieldrin, which is linked to DDT (no longer used but still persisting in ecosystems) and its metabolites, DDD and DDE. Organochlorine insecticides are believed to kill mostly young bats when the chemicals, concentrated in the fat of the mother's milk, are passed to the pups or when flight begins and fat reserves from lactation are burned. Adult hoary bats are most likely to be affected by fat-soluble toxins released when fat reserves are consumed during migration or hibernation (Clark 1981, 1988b, Clark *et al.* 1978a, 1978b).

Priority Conservation Actions

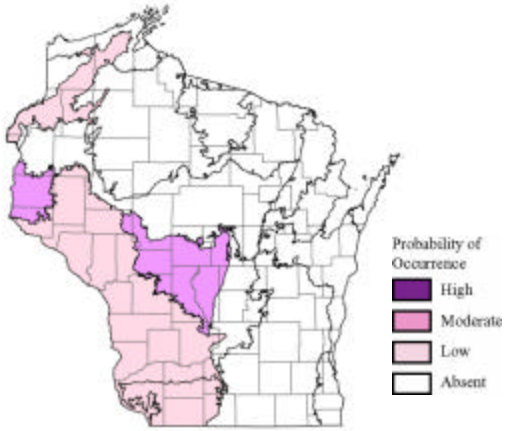
- Legislation is needed that increases protection of bats during all phases of their life history, i.e., migration, foraging, nursery sites, and summer roost sites.
- Research is needed on most aspects of life history, including roosting, and foraging habitat requirements, population dynamics, population trends, and migration and dispersal patterns. An assessment of the habitats needed to support all life history stages and activities is needed before adequate stewardship programs can be devised.
- Inventories should be conducted in advance of large-scale habitat modifications that would result in the loss of older forest or removal of standing dead trees within areas known or suspected to contain this species.
- Outreach is needed to educate the public on bat biology and ecology, to reduce unfounded fears and myths, and to provide training for citizens to assist in monitoring efforts.
- A statewide bat management plan is needed to outline a coordinated and comprehensive approach to bat conservation in Wisconsin, and should include identification of important conservation partners.
- Protection and restoration of summer roosting areas associated with older forests having a diverse age structure (including large trees and small openings) should benefit hoary bat populations.
- Protection of foraging habitat, if disjunct from summer roosts and maternity colonies, may be most effectively gained through private or public landowner cooperation.

White-tailed Jackrabbit (*Lepus townsendii*)

Species Assessment Scores*

State rarity:	5
State threats:	3
State population trend:	5
Global abundance:	3
Global distribution:	4
Global threats:	3
Global population trend:	3
Mean Risk Score:	3.7
Area of importance:	1

* Please see the Description of Vertebrate Species Summaries (Section 3.1.1) for definitions of criteria and scores.



Ecological Landscape Associations
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Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Central Sand Plains	Dry prairie
Central Sand Plains	Dry-mesic prairie
Central Sand Plains	Sand prairie
Central Sand Plains	Surrogate Grasslands
Southwest Savanna	Dry prairie
Southwest Savanna	Dry-mesic prairie
Western Coulee and Ridges	Dry prairie
Western Coulee and Ridges	Dry-mesic prairie
Western Coulee and Ridges	Sand prairie
Western Prairie	Dry prairie
Western Prairie	Dry-mesic prairie
Western Prairie	Sand prairie
Western Prairie	Surrogate Grasslands

Threats and Issues

- Predation threatens this species.
- Diseases such as Tularaemia and cuterabra (botfly) may be a threat to this species.
- Loss of prairie habitat to agricultural cultivation, roads, and housing is a threat to this species.
- Legal harvest/shooting may be an issue for this species (it is listed as a game animal in Wisconsin with a daily bag limit of 3, and a season from October 16 to November 15).
- Mortality from vehicles may be an issue for this species.

Priority Conservation Actions

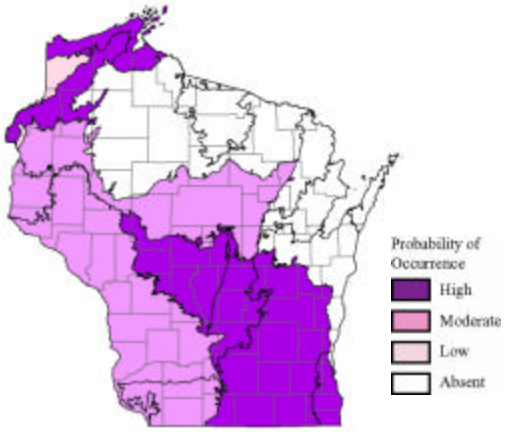
- Reintroduction into regions covered by the Greater Prairie Chicken and Sharp-tailed Grouse Management Plans may be the most viable means of re-establishing this species.
- Consensus is needed on whether the species should be considered as introduced, non-native, or native through range expansion in Wisconsin. The latter designation would suggest that additional conservation action may be warranted, including protection from harvest.
- Providing clearings and prairies will be beneficial for this species, as it prefers open country. Formerly rare, the jackrabbit has become numerous as a result of clearing and drainage operations.

Franklin's Ground Squirrel (*Spermophilus franklinii*)

Species Assessment Scores*

State rarity:	4
State threats:	3
State population trend:	5
Global abundance:	4
Global distribution:	4.5
Global threats:	4
Global population trend:	4
Mean Risk Score:	4.1
Area of importance:	2

* Please see the Description of Vertebrate Species Summaries (Section 3.1.1) for definitions of criteria and scores.



Ecological Landscape Associations
Please note that this is not a range map. Shading does not imply that the species is present throughout the Landscape, but represents the probability that the species occurs somewhere in the Landscape.

Landscape-community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Central Sand Hills	Oak barrens
Central Sand Hills	Pine barrens
Central Sand Hills	Sand prairie
Central Sand Hills	Wet-mesic prairie
Central Sand Plains	Dry-mesic prairie
Central Sand Plains	Oak barrens
Central Sand Plains	Pine barrens
Central Sand Plains	Sand prairie
Central Sand Plains	Surrogate Grasslands
Northwest Sands	Pine barrens
Northwest Sands	Surrogate Grasslands
Southeast Glacial Plains	Dry-mesic prairie
Southeast Glacial Plains	Mesic prairie
Southeast Glacial Plains	Oak opening
Southeast Glacial Plains	Oak woodland
Southeast Glacial Plains	Surrogate Grasslands
Southeast Glacial Plains	Wet-mesic prairie
Southern Lake Michigan Coastal	Great lakes dune
Southern Lake Michigan Coastal	Oak opening
Southern Lake Michigan Coastal	Wet-mesic prairie
Southwest Savanna	Dry-mesic prairie
Southwest Savanna	Oak opening
Superior Coastal Plain	Great lakes dune
Western Coulee and Ridges	Dry-mesic prairie
Western Coulee and Ridges	Oak barrens
Western Coulee and Ridges	Oak opening
Western Coulee and Ridges	Sand prairie

Threats and Issues

- Insufficient knowledge of Franklin's ground squirrel distribution and habitat use precludes active management.
- A lack of efficient and effective survey techniques limits our knowledge of Franklin's ground squirrel distribution, population size, and habitat use.
- Isolation of small populations by unsuitable habitat, roads, and urban areas may limit juvenile dispersal and result in local extirpation.
- Loss of savanna, shrub, and grassland habitat due to agriculture, urbanization, road construction, and forest succession threatens this species.

Priority Conservation Actions

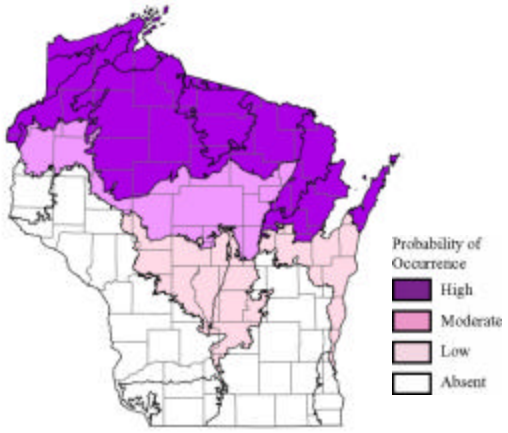
- Research is needed to determine Franklin's ground squirrel distribution, habitat use, population size, and mortality factors in Wisconsin before effective management strategies can be developed and implemented.
- Identification, protection, and monitoring of existing Franklin's ground squirrel colonies is warranted.

Northern Flying Squirrel (*Glaucomys sabrinus*)

Species Assessment Scores*

State rarity:	2
State threats:	3
State population trend:	4
Global abundance:	3
Global distribution:	3.5
Global threats:	3
Global population trend:	4
Mean Risk Score:	3.2
Area of importance:	2

* Please see the Description of Vertebrate Species Summaries (Section 3.1.1) for definitions of criteria and scores.



Ecological Landscape Associations
Please note that this is not a range map. Shading does not imply that the species is present throughout the Landscape, but represents the probability that the species occurs somewhere in the Landscape.

Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
North Central Forest	Northern mesic forest
North Central Forest	Northern wet forest
North Central Forest	Northern wet-mesic forest
Northeast Sands	Northern dry-mesic forest
Northeast Sands	Northern wet-mesic forest
Northern Highland	Northern dry-mesic forest
Northern Highland	Northern wet forest
Northern Lake Michigan Coastal	Northern mesic forest
Northern Lake Michigan Coastal	Northern wet-mesic forest
Northwest Lowlands	Northern wet forest
Northwest Sands	Northern dry-mesic forest
Northwest Sands	Northern wet forest
Superior Coastal Plain	Boreal forest

Threats and Issues

- Northern flying squirrels are threatened by a lack of old forest habitat.
- More information is needed to determine how other species (southern flying squirrels and weasels) may affect the population status of Northern flying squirrels in Wisconsin.

Priority Conservation Actions

- Nest boxes may be useful in augmenting populations until forest structure develops to provide large cavity trees, snags, and woody debris.
- There is a need to maintain forest characteristics which support lichens and fungi, especially subterranean forms, which are a primary food source of the northern flying squirrel (Whitaker and Hamilton1998, Weigl 1978).

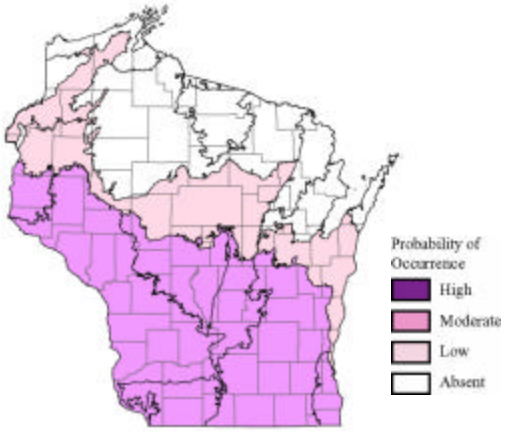
- More research on local habitat relationships and interactions with other species (e.g., range overlap with the southern flying squirrel) is needed for successful management and conservation of this species.
- Additional information on life history and ecology of flying squirrels in the upper midwest, including micro- and macro-habitat preferences, is needed before specific forest management guidelines can be developed that aid conservation of this species.
- Retention of small groups of large snags and live trees exhibiting evidence of disease or physical defects would ensure availability of denning structures after logging.
- Increasing old-growth stand characteristics and conifer composition of northern forests would benefit this species.

Prairie Vole (*Microtus ochrogaster*)

Species Assessme nt Scores*

State rarity:	4
State threats:	3
State population trend:	4
Global abundance:	3
Global distribution:	4
Global threats:	3
Global population trend:	3
Mean Risk Score:	3.4
Area of importance:	2

* Please see the Description of Vertebrate Species Summaries (Section 3.1.1) for definitions of criteria and scores.



Ecological Landscape Associations
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Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Central Sand Hills	Dry prairie
Central Sand Hills	Sand prairie
Central Sand Plains	Dry prairie
Central Sand Plains	Dry -mesic prairie
Central Sand Plains	Oak barrens
Central Sand Plains	Sand prairie
Central Sand Plains	Surrogate Grasslands
Southeast Glacial Plains	Dry prairie
Southeast Glacial Plains	Dry -mesic prairie
Southeast Glacial Plains	Mesic prairie
Southeast Glacial Plains	Oak opening
Southeast Glacial Plains	Surrogate Grasslands
Southwest Savanna	Dry prairie
Southwest Savanna	Dry -mesic prairie
Southwest Savanna	Mesic prairie
Southwest Savanna	Oak opening
Southwest Savanna	Surrogate Grasslands
Western Coulee and Ridges	Dry prairie
Western Coulee and Ridges	Dry -mesic prairie
Western Coulee and Ridges	Oak barrens
Western Coulee and Ridges	Oak opening
Western Coulee and Ridges	Sand prairie
Western Coulee and Ridges	Surrogate Grasslands
Western Prairie	Dry prairie
Western Prairie	Dry -mesic prairie
Western Prairie	Mesic prairie
Western Prairie	Sand prairie
Western Prairie	Surrogate Grasslands

Threats and Issues

- As with many other small mammal species, more information is needed on habitat requirements, distribution, status, and effects of land uses and management practices to inform conservation efforts targeting this species.
- Severe overgrazing of pasture and grasslands is a threat to this species (Kostova *et al.* 2004).
- Exposure to chemicals (e.g., pesticides including diazinon) can negatively impact ecological relationships and reproduction in both herbivorous and omnivorous mammals; negative impacts on populations and community structure and function may persist longer than the chemicals persist in the environment (Sheffield and Lochmiller 2001).
- Competition from meadow voles limit prairie voles to drier grassland habitats where they co-occur.
- Loss and isolation of native prairie and grassland habitat due to a variety of factors including fire suppression, succession to forested communties, and invasion by both native and exotic shrubs (e.g., common buckthorn). In addition, fragmentation and loss of other habitat types used by praire voles including surrogate prairie grasslands and small grain and weedy agricultural fields are a threat to the species (Kaufman *et al.* 2000, Bock *et al.* 2002).

Priority Conservation Actions

- Protection, management, and restoration of additional existing and potential habitat areas throughout southeast Wisconsin is needed.
- Better information on distrubution, abundance, and population trends is needed to inform conservation efforts.
- Restore, manage, and protect dry and sand prairie and open barrens habitat in and near the Driftless Area of southwest Wisconsin; maintain some open sparse or weedy grasslands on light soils; encourage grassland restorations and surrogate grasslands that are not overly dense; and encourage small grain fields on private lands and when leasing public properties. Prairie restorations may provide good habitat during intital years of establishment, even on heavy soils when lighter soils are nearby.
- Land-use planning is needed that discourages houses and other development from replacing grasslands, old fields and low-impact agriculture.
- Overgrazing of grasslands should be addressed to provide additional high quality habitat for this species.
- Limit use of chemicals and pesticides, including diazinon, on grassland habitats because of their known negative affects on reproduction and other aspects of small mammal biology.
- Reintroductions may be warranted in restored grasslands.

Woodland Vole (*Microtus pinetorum*)

Species Assessment Scores*

State rarity:	5
State threats:	2
State population trend:	3
Global abundance:	3
Global distribution:	4
Global threats:	2
Global population trend:	3
Mean Risk Score:	3.1
Area of importance:	2

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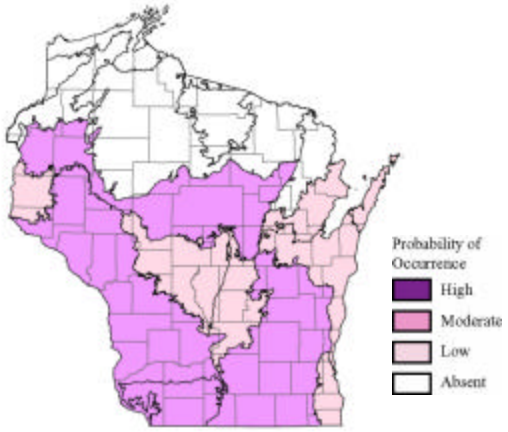

Ecological Landscape Associations
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Landscape-community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Central Sand Hills	Southern dry forest
Southeast Glacial Plains	Oak opening
Southeast Glacial Plains	Oak woodland
Southeast Glacial Plains	Southern dry forest
Southeast Glacial Plains	Southern dry-mesic forest
Southwest Savanna	Oak opening
Southwest Savanna	Oak woodland
Western Coulee and Ridges	Oak opening
Western Coulee and Ridges	Oak woodland
Western Coulee and Ridges	Southern dry forest
Western Coulee and Ridges	Southern dry-mesic forest

Threats and Issues

- Flooding of dry habitats and agricultural areas decreases habitat for this species which is often associated with the edges of forests and old fields.
- Skin disease may be an important factor in the health of woodland voles
- Poisoning from pest control efforts, primarily in orchards, is a threat to this species.

Priority Conservation Actions

- Reducing saturation of soil in areas occupied by woodland voles would benefit this species
- Extensive inventory work is needed to determine the range and habitat requirements of this species, and to establish whether the limited information available on the status of this species in Wisconsin (broadly distributed in the state, but rare) is indeed accurate, or is an artifact of minimal survey effort and the use of ineffective sampling techniques.

Woodland Jumping Mouse (*Napaeozapus insignis*)

Species Assessment Scores*

State rarity:	4
State threats:	3
State population trend:	3
Global abundance:	4
Global distribution:	5
Global threats:	3
Global population trend:	3
Mean Risk Score:	3.6
Area of importance:	2

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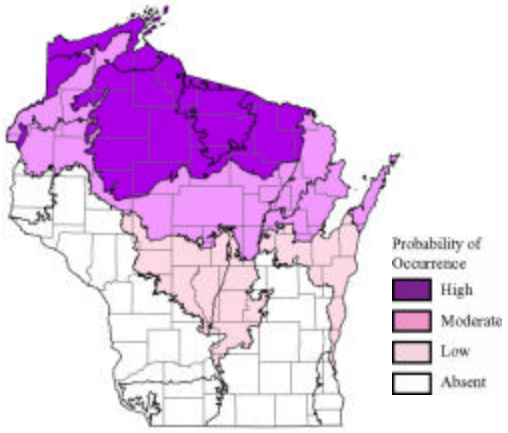

Ecological Landscape Associations
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Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Forest Transition	Northern mesic forest
North Central Forest	Ephemeral pond
North Central Forest	Hardwood swamp
North Central Forest	Northern mesic forest
North Central Forest	Northern wet forest
North Central Forest	Northern wet-mesic forest
Northern Highland	Northern mesic forest
Northern Highland	Northern wet forest
Northern Lake Michigan Coastal	Northern mesic forest
Northwest Lowlands	Northern mesic forest
Northwest Lowlands	Northern wet forest
Superior Coastal Plain	Boreal forest
Superior Coastal Plain	Northern mesic forest

Threats and Issues

- Reduction of herbaceous vegetation cover in moist deciduous forests is a threat to this species.
- This species has a narrow habitat breadth (Miller and Getz 1977).
- Interspecific competition and (or) predation may limit availability of habitats for woodland jumping mice.
- Elimination of suitable hibernation sites may be a threat to this species.
- Predation threatens this species.
- Cold winters without an insulating snow cover - hibernating animals freeze to death.
- Insufficient hibernation fat stores in young of the year, especially for animals born late.

Priority Conservation Actions

- Protection and monitoring of suitable habitats for this species are needed.
- Maintenance and restoration of forested seeps, drainages, and stream-side herbaceous habitats will benefit this species.
- Distribution and abundance information is needed for this species. Better quantification of macro- and micro-habitat needs would aid conservation efforts.

Gray Wolf (*Canis lupus*)

Species Assessment Scores*

State rarity:	4
State threats:	3
State population trend:	1
Global abundance:	4
Global distribution:	3
Global threats:	2
Global population trend:	2
Mean Risk Score:	2.7
Area of importance:	3

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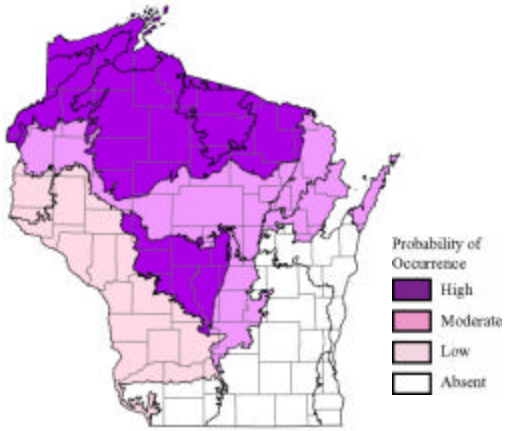

Ecological Landscape Associations
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Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Central Sand Plains	Alder thicket
Central Sand Plains	Central sands pine-oak forest
Central Sand Plains	Northern wet forest
North Central Forest	Alder thicket
North Central Forest	Northern mesic forest
North Central Forest	Northern wet forest
North Central Forest	Northern wet-mesic forest
Northern Highland	Northern dry-mesic forest
Northern Highland	Northern wet forest
Northwest Lowlands	Northern wet forest
Northwest Sands	Northern dry-mesic forest
Northwest Sands	Northern wet forest
Superior Coastal Plain	Boreal forest

Threats and Issues

- Human-caused mortality from illegal shooting, trapping, and vehicle collisions may be major limiting factors in portions of the wolf's range.
- Mortality from a variety of diseases including canine parvovirus, infectious canine hepatitis, canine distemper virus, heartworm, and Blastomycosis are important mortality factors that may limit the wolf population.
- Sarcoptic mange is an important health concern and cause of mortality in Wisconsin wolf populations, along with other parasites including protozoans, intestinal worms, ticks, mites, lice, and heartworm.
- Spread of Chronic Wasting Disease in deer and elk could reduce future numbers of these prey species, or may require local reductions of these cervids which would affect abundance of wolves.

- Habitat fragmentation and human development could negatively affect wolf population trends in Wisconsin, and reduce area of suitable habitat which may reduce the potential carrying capacity of wolves in the future.
- Road densities reflecting motorized access and the level of human-use on such access are key factors in establishing and maintaining wolf populations.
- Future human developments of highway, residential, commercial, and industrial areas may reduce wolves' ability to disperse across the landscape and could cause isolation of portions of the wolf population, leading to genetic and stochastic population problems.
- Interbreeding of wolf/dog hybrids and wild wolves may dilute the gene pool with the instincts and behaviors of domestic dogs, potentially reducing long term viability and increasing rates of livestock depredation.
- Agricultural expansion of livestock and hobby farms into forest areas of central and northern Wisconsin may increase conflicts with wolves and humans, and creates needs for more intense lethal controls on wolves.

Priority Conservation Actions

- Wolf habitat maintenance is needed in northern and central Wisconsin management areas on suitable lands (especially county forests, national forests, and private industrial forests) through management of public motorized access, protection of den and rendezvous sites, and forest management to support adequate prey populations.
- Protection of suitable forested habitat linkages and corridors for wolf dispersal to and from Minnesota and Michigan, as well as within Wisconsin is needed to maintain genetic diversity in wolf populations.
- Support of zoning and Smart Growth efforts are needed in forested areas to maintain forest cover and reduce developments detrimental to wolves and other forest wildlife.
- Accurate population counts via radio collaring along with snow tracking and summer howling surveys are needed to determine if wolves are attaining management goals in Wisconsin.
- Health monitoring is needed to continue to assess the health of the population, including impacts on the population from disease, parasites, and other important sources of mortality.
- Aggressive control needs to be maintained on ungulate diseases such as CWD or TB that could devastate deer and elk populations, and cause major reductions in wolf numbers, or cause drastic increase in livestock depredation by wolves.
- Continuing public education about wolves is needed to promote a greater acceptance of wolves and reduce unfounded fears and myths. Specific information is needed on ways to live with wolves, needs for wolf control activity, and a better understanding of the role of wolves in forest ecosystems.
- Possession of wolf/dog hybrids needs to be regulated due to their potential negative impact on wild, free ranging wolves.
- Research is needed to more effectively manage wolf populations in Wisconsin, including developing reliable and economical wolf census techniques to accurately document numbers and distribution, identifying wolf travel corridors, identifying factors causing low pup survival, and identifying factors apparently limiting wolf colonization in northeastern Wisconsin
- Re-measurement of public attitudes towards wolves and recovery in the state is needed to define reasonable wolf population goals and acceptable wolf habitat.
- Models are needed that 1) predict potential den and rendezvous sites within suitable wolf habitat so these sensitive areas can be protected from human disturbance, 2) estimate the state wolf population

using existing survey and population data and identify needs for additional surveys, and 3) further examine the viability of the state wolf population.

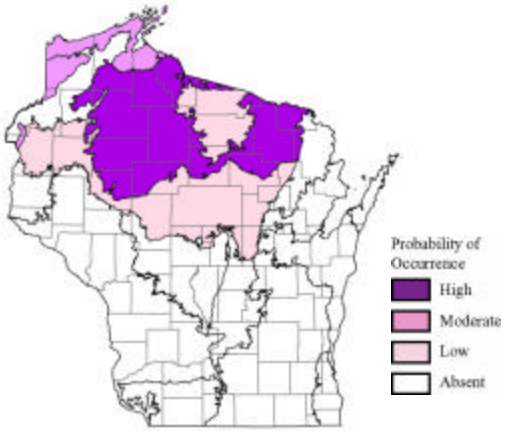
- Long-term research on wolf ecology, population growth, and depredation concerns in central Wisconsin is needed.
- Develop a proactive program to minimize wolf/livestock conflicts. Human acceptance of wolves is essential to maintenance of the species on the landscape, which relies upon some level of livestock owner tolerance.
- In the context of ensuring public acceptance, lethal control of wolves to minimize depredation losses could be considered a legitimate conservation action.

American Marten (*Martes americana*)

Species Assessment Scores*

State rarity:	3
State threats:	3
State population trend:	4
Global abundance:	4
Global distribution:	4
Global threats:	3
Global population trend:	3
Mean Risk Score:	3.4
Area of importance:	2

* Please see the Description of Vertebrate Species Summaries (Section 3.1.1) for definitions of criteria and scores.



Ecological Landscape Associations
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Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
Forest Transition	Northern mesic forest
North Central Forest	Boreal forest
North Central Forest	Hardwood swamp
North Central Forest	Northern dry -mesic forest
North Central Forest	Northern mesic forest
North Central Forest	Northern wet forest
North Central Forest	Northern wet -mesic forest
Northern Highland	Northern dry -mesic forest
Northwest Lowlands	Boreal forest
Northwest Lowlands	Northern dry -mesic forest
Northwest Lowlands	Northern mesic forest
Superior Coastal Plain	Boreal forest
Superior Coastal Plain	Northern dry -mesic forest
Superior Coastal Plain	Northern mesic forest

Threats and Issues

- Inbreeding depression resulting from the small, disjunct populations present in Wisconsin is possible.
- A loss of or decrease in woody debris, or failure to maintain a predominantly closed canopy in areas inhabited by martens are major threats.
- Incidental harvest may be a threat to martens. Although they are not a legal game species in Wisconsin, marten are easily trapped and can easily be caught in traps set for other species (e.g., fisher, mink, raccoon). Any change in trapping status of the current Marten Restoration Areas could be a serious threat to existing populations.

Priority Conservation Actions

- Additional reintroductions to existing populations and in new areas may be needed to support American marten existence in Wisconsin. The source population needs to be identified from outside the state, because neither population here is high enough to support any translocations. Additional areas with potential for reintroduction could be identified using habitat information (e.g., course land cover, land use, and forest structure) currently available.
- There is a great need for conservation of genetic resources for martens. There are few animals in the breeding populations, and these breeding populations are separated by long distances preventing exchange of genetic material. Activities should be designed to collect, archive and analyze genetic material from Wisconsin martens in order to detect unacceptable genetic changes in the population.
- Promotion of uneven-aged forest management (i.e., selective cutting) that maintains a predominantly closed canopy and retains adequate numbers of large diameter trees, brush piles, and large woody debris will benefit marten.

Moose (*Alces alces*)

Species Assessment Scores*

State rarity:	5
State threats:	3
State population trend:	3
Global abundance:	3
Global distribution:	3
Global threats:	2
Global population trend:	2
Mean Risk Score:	3
Area of importance:	1

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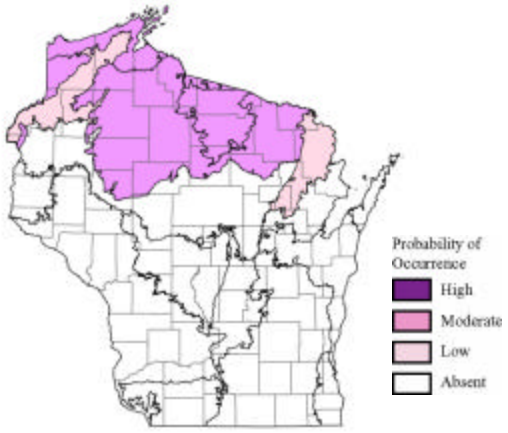

Ecological Landscape Associations
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Landscape -community Combinations of Highest Ecological Priority

Ecological Landscape	Community
North Central Forest	Alder thicket
North Central Forest	Emergent marsh
North Central Forest	Hardwood swamp
North Central Forest	Inland lakes
North Central Forest	Northern wet-mesic forest
North Central Forest	Submergent marsh
Northern Highland	Emergent marsh
Northern Highland	Inland lakes
Northern Highland	Submergent marsh
Northern Highland	Submergent marsh - oligotrophic
Superior Coastal Plain	Boreal forest
Superior Coastal Plain	Emergent marsh
Superior Coastal Plain	Submergent marsh

Threats and Issues

- High white-tailed deer populations (related to prevalence of the meningeal brainworm in white-tailed deer) and baiting of deer near conifer wetlands (which causes high concentrations of fecal deposits and snail activity that increases meningeal worm spread) are a threat to moose.
- Calf predation by wolves and black bear may be a threat to moose populations.
- Inadequate shrub supply and forest composition alterations to plant species less preferred as browse or thermal cover, can be a threat to moose.
- Warm summers and poor tolerance of warm/hot conditions may be a threat to moose.
- A high prevalence of ticks due to mild winters may be a threat to moose.
- Developments on shallow lakes, ponds, lakeshores, and riverine habitat reduce potential habitat for moose.

- Increased road densities and traffic, increasing the risk of vehicle collisions or illegal shooting, are a threat to this species.

Priority Conservation Actions

- Reducing deer densities in restoration areas would be a benefit for this species.
- This species benefits from forest management activities that create a mosaic of successional stages, providing forage and thermal cover.
- Protection of shallow lakes and ponds from development is needed, along with minimizing development on other bodies of water.
- Maintaining low road densities on public lands would be a benefit to moose.
- There is a need to establish management zones for moose.
- Restrictions on feeding and baiting of deer are needed.
- Increased monitoring of existing moose is needed.